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A Review of Wheel Impact Measurement Variation

RB Wiley and Abeer Elsaleiby

Summary

The repeatability of wheel impact load detector (WILD) measurements is often questioned because removal of high impact wheels constitutes a major expense to car owners. The WILD impact history of a typical out of round wheel can vary. The variations can appear to be quite large due to varying speeds and load conditions. Other factors related to the defect location on the wheel tread and with the tread position on the rail can also affect measurement consistency. Thus, the repeatability questions are understandable and to be expected.

A WILD data review and analysis for an example set of wheels was conducted. These wheels were selected for review by the owner because they had WILD alerts (i.e., at opportunistic repair or condemnable levels). The primary conclusion of these studies is that repeatability of optimal WILD measurements is more a function of normal variation in rail vehicle operating circumstances, with no relationship to the measurement system's capability itself. Specific to the example wheels, all were shown to be out of round, confirmed by reliable evidence from multiple readings from WILDs.

The analysis was intended to qualify and quantify the nature and causes of measurement variation. WILD data histories for 60 wheels from 56 cars were reviewed.

The analysis results for these 60 wheels showed that anomalous readings were not the cause of the reading variation. Of the 60 wheels, seven remained in the category of the original basic question, that of having a single high reading (i.e., qualifying as an opportunistic repair or as a condemnable level alert). These seven wheels showed clear evidence of being out of round, but had reduced opportunities to obtain optimum WILD measurements (e.g., low mileage or mostly measured while empty).

A separate review of industry-wide data for alerted wheels of the same levels also indicates consistently repeatable, although variable, vertical impact force measurements. An extension to this review shows a strong correlation between repeatability of high wheel impact readings and frequency of opportunities to optimally measure the same wheels at a WILD site. Conversely, reduced opportunities yielded low counts of repeatable readings. These results will be reported in a subsequent *Technology Digest* (TD).

This TD addresses results and conclusions for the Phase 1 wheel examples review. Next, Phases 2 and 3 will expand the data in an industry-wide study to establish the level of confidence in WILD measurements while considering a potentially larger set of variation causes. A follow-on TD will describe the results and conclusions from the industry-wide review.



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